Enhancing Learner Self-Esteem for Learning Improvements

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Abstract

In this paper, we propose to integrate the self esteem component within learning process. The goal was to introduce a new strategy to enhance learner self esteem while interacting with a tutoring system. This approach is based on a subliminal, non consciously perceived, self esteem conditioning priming method. We conducted an experimental study to measure the effect of this strategy on participant self esteem and analyze its impact on learning performance. We have also monitored participants' physiological activity to analyze the effects of our approach on learner affective state.

In recent years, Intelligent Tutoring System researchers have accorded an increasing interest to learner affect. Several works focused on affective student modeling using a variety of physical cues to recognize affective state (Picard, 1997) including observable changes like face expressions, body postures, vocal tones, and physiological signal changes such as heart rate, skin conductivity, temperature, and brain electrical activity. Ultimately, the goal is to properly adapt tutorial interventions to improve learner performance. On the other side, many educators and pedagogues advocate the benefits of self-esteem on learner self-confidence and academic achievement and success (Hansford and Hattie, 1982). Literature differentiates between explicit self-esteem and implicit self-esteem (Dijksterhuis, 2004). The former is based on conscious mode of thinking and can be measured by means of questionnaires, whereas the latter is the result of automatic self-evaluative process and can be assessed with indirect measures. Unlike explicit measures which are based on generally biased self-report, implicit measures are based on unconscious attitude toward the self (Dijksterhuis, 2004). These latter are mostly used in unconscious process based researches. Their basic assumption lies on the existence of a threshold-line of conscious perception. The idea is that a stimulus below this threshold of awareness, also called subliminal stimulus cannot be consciously perceived but can yield affective reactions without awareness (Del Cul, Baillet and Dehaene, 2007). This technique is known as subliminal priming. It has been applied in different contexts (Hassin, Uleman and Bargh, 2005) including self-esteem conditioning (Dijksterhuis, 2004) and learning improvement (Chalfoun and Frasson, 2008).

In this paper, we propose to integrate the implicit self-esteem component within learning process. More precisely, the aim is to enhance learner self-esteem while interacting with a tutoring system, using a subliminal priming strategy. The hypothesis we establish is that this method can improve learner performance. We propose to build an experiment with a subliminal self-esteem conditioning priming strategy. Our questions are the following: can subliminal priming enhance participants' measured implicit self-esteem? Can this strategy produce a positive effect on learning performance? Is there any effect on learners' affective states?

Method

Materials. The tutoring environment consists of a multiple choice questionnaire related to logic. The questions are typically found in brain training exercises or in tests of reasoning ability. They involve inferential skills on information series and do not require particular prerequisites in any field of knowledge. The Questionnaire is composed of *3* modules. Each module consists of a tutorial and *5* questions concerned with specific forms of data (geometrical shapes, numbers and letters).

Enhancing Self-esteem. In order to enhance learner self-esteem, we used an evaluative conditioning (EC) subliminal procedure (Dijksterhuis, 2004). This method consists in subliminally projecting self-referent words paired with positive words. The idea is that EC influences the structure of associations in memory, and hence the automatic affective reactions resulting from these associations (Gawronski and Bodenhausen, 2007). This method has already been found to influence self-esteem in

earlier experiments (Dijksterhuis, 2004). In our experiment, some participants (experimental condition), were repeatedly projected with subliminal primes. The other participants (control condition), were not presented with subliminal primes. Projecting thresholds were carefully chosen according to neural recommendations (Del Cul, Baillet and Dehaene, 2007). Each subliminal prime was displayed for *29 ms* preceded and followed by a *271 ms* mask of a set of sharp symbols.

Affect Recognition. Physiological signals were recorded continuously during the experiment to monitor learners' mental and emotional activities. We used three types of sensors: electroencephalograms (EEG), skin conductance (SC) and blood volume pulse (BVP) sensors. Heart rates (HR) and galvanic skin response (GSR) were derived from BVP and SC. These measures are known to be correlated to valence (positive to negative) and arousal (low to high) (Lang, 1995). In order to analyze participants' mental state, we used EEG signals. Neural research established various EEG-based neural indexes of cognition. More precisely, literature on attention and vigilance defined an EEG mental engagement index (Pope, Bogart and Bartolome, 1995). Higher index value reflects higher task engagement and alertness. We used this index as an indication of the participants' mental engagement while answering to the questionnaire.

Participants. *39* participants ranged in age from *19* to *47* years (*M = 27.34*, *SD = 6.78*) took part to our study in return for a compensation of *10* CAD. They were assigned either to the experimental condition (*13* males, *7* females) or to the control condition (*11* males, *8* females).

Results

Self-esteem. Learner self-esteem was assessed using the Initial Preference Task (IPT, (LeBel and Gawronski, 2009)). Participants were asked to evaluate their attractiveness for all letters of the alphabet on a *7*-point scale. High self-esteem is indexed by the extent to which a person prefers his or her initials to other letters of the alphabet. It was found that IPT effect was more pronounced for participants in the conditioned self-esteem group (*M = 1.68, SD = 0.94*) compared to participants in the control condition (*M = 1.08, SD = 0.99*) indicating higher self-esteem. This difference was statistically reliable, $F(1, 37) = 4.84, p < .05$.

Performance. In order to assess learner performance we evaluated marks obtained in the questionnaire. Each correct answer was worth *4* points, an incorrect answer *-1*, and a no answer *0*. Final marks were significantly higher in the experimental condition (*M = 33.4, SD = 12.36*) compared to those in the control condition (*M= 25.5, SD = 9.87*), $F(1, 37) = 4.37, p < .05$.

Learners' affect. A main effect of priming conditions was found for participant mental engagement: subliminally primed participants reported higher engagement index values (*M = .75, SD = 0.11*) than no primed participants (*M = .71, SD = .09*). $F(1, 583) = 16.23, p < .001$. Besides, a significant main effect was found for GSR signals, $F(1, 583) = 33.98, p < .05$. Participants under the experimental condition reported higher GSR values and hence higher arousal (*M = 1.26, SD = 4.42*) than participants under the control condition (*M = -.91, SD = 3.93*). The main effect was not significant for HR, $F(1, 583) = .64, p = n.s.$

Conclusion

In this paper, we have proposed a new strategy to enhance learner self-esteem while interacting with a tutoring system. This approach is based on a subliminal, non-consciously perceived, self-esteem conditioning method. Our experimental study has shown that this method enhanced participants' measured implicit self-esteem on one hand and learning performance on the other hand. On the other side, priming conditions elicited different mental and emotional reactions in terms of task engagement and arousal. We believe that these findings can yield interesting implications in intelligent tutoring systems. Future works is directed towards learners' self-esteem modeling in order to extend ITS learner's module.

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